Advanced Gear Manufacturing and Metrology

INSTRUCTOR:
Lance Brown
Email: brown@motionpower.org

COURSE INFORMATION

Course Description

This three-day intensive course provides a rigorous, practical foundation in the manufacturing and metrology of precision involute gears. Participants develop a thorough understanding of gear geometry, material and heat treatment selection (as seen through a manufacturing lens), all major soft- and hard-cutting processes, surface integrity, inspection and metrology.

It is recommended that participants spend a minimum of one hour reviewing course material each evening.

Who Should Attend

Gear manufacturing engineers, process engineers, quality engineers, tooling specialists, and technical managers responsible for the design, production, or quality of precision gear components. Also suited for gear designers seeking a deeper understanding of how manufacturing and metrology decisions affect performance and cost.

Learning Objectives

- Calculate key geometry parameters for spur, helical, bevel, and worm gear sets from the involute tooth form
- Select materials and specify heat treatment cycles, case depth, and distortion requirements for carburized gears
- Compare all major soft- and hard-cutting processes and select the appropriate method for a given application
- Apply the appropriate inspection methods and interpret the results of such measurements
- Recognize primary gear failure modes per AGMA 1010 as related to manufacture
- Apply DFM principles to gear drawings including quality class selection and datum definition

Required Textbook
Textbook will be provided by AGMA
Formula Reference Card

COURSE OUTLINE

1. Introduction & Structure
2. Gear Fundamentals & Nomenclature
3. Involute Geometry & Math – Spur/Helical

4. Bevel and Worm Gear Geometry
5. Gear Materials
6. Heat Treatment
7. Soft Cutting – Cylindrical Gears
8. Soft Cutting – Bevel Gears/Worm Gearing
9. Process Planning & Manufacturing Chain
10. Gear Grinding
11. Other Hard Finishing Methods
12. Surface Integrity
13. Gear Inspection and Metrology
14. Process Control
15. Process Optimization
16. Tooling Management
17. Gear Noise and NVH
18. Near-Net-Shape & Emerging Technology
19. Gear Failure Modes
20. Cost of Quality & Design for Manufacturability
21. Course Wrap-Up

STUDENT FEEDBACK AND GRADING PROCEDURES

Assignments

Assignments and learning activities are administered at the instructor's discretion. Group discussion and immediate feedback are incorporated throughout.

COURSE MANAGEMENT

Weather Delays and Cancelations

We will communicate any cancellations, delays or other concerns for safety prior to class via email, voicemail, and/or text message. Please be sure that we have all pertinent contact information as you travel to your class location.

Attendance for Domestic and International Students

Please be mindful that these are short, accelerated courses. Attendance is extremely important. If you are going to be absent from any class day, please contact the course coordinator.

Plagiarism, Cheating and other types of Misconduct

Plagiarism[1], cheating and other types of misconduct are unacceptable.

Students with Disabilities

Students requiring assistance and accommodation should complete the Special Accommodation Request form and submit it to Stephanie Smialek, Education Manager at smialek@motionpower.org. She can be reached at 773-302-8026.

1 Plagiarism is defined as "the use or close imitation of the language and thoughts of another author and the representation of them as one's own original work."

Grievance Procedures
Students who have concerns about the class are encouraged to contact Stephanie Smialek, Education Manager, at smialek@motionpower.org or 773-302-8026.

Outline Changes
The instructor reserves the right to modify the outline during the course of the class.

LEARNING AND OTHER RESOURCES

Links for writing resources:

- grammar.ccc.commnet.edu/grammar
- www.merriam-webster.com

Links for Math resources:

- www.sosmath.com
- Khan Academy on www.youtube.com

Links for time management, study skills and note taking resources:

- www.mindtools.com
- www.testakingtips.com

Links for career resources:

- https://www.agma.org/newsroom/jobs/

Industry News:

- https://www.agma.org/newsroom/industry-news/